UKTAG Environmental Standards

Lake Nitrogen

by

Water Framework Directive – United Kingdom Technical Advisory Group (WFD-UKTAG)

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Health and safety statement

WARNING. Working in or around water is inherently dangerous; persons using this standard should be familiar with normal laboratory and field practice. This published monitoring system does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user to establish appropriate health and safety practices and to ensure compliance with any national regulatory guidelines.

It is also the responsibility of the user if seeking to practice the method outlined here, to gain appropriate permissions for access to water courses and their sampling.

UKTAG Environmental Standards – Lake Nitrogen

1. Introduction

This method statement describes how to determine the WFD standard and class for the supporting element nitrogen in lakes. Lake nitrogen standards have been developed for the first time for use in the third river basin planning cycle.

Nitrogen standards are used in managing the risk of adverse ecological impacts. Where lakes are already adversely affected, nitrogen standards can indicate the likely degree to which nitrogen concentrations would need to be reduced (e.g. by reducing concentrations in discharges) to improve ecological quality. Where a new discharge is proposed, nitrogen standards can indicate whether or not the lake is likely to be able to accommodate the additional inputs without significant risk of adverse ecological effects.

The relevant standards for nitrogen must be met for a lake to be classed as being at good or high ecological status. Although standards for moderate, poor and bad status have been derived to inform management decisions, these do not drive overall classification of status below moderate, as this is determined only by the status of biological elements.

2. Nitrogen standards

The nitrogen standards (also referred to as class boundary values) for a lake are type specific, with the appropriate lake type determined from mean depth of the lake and the concentration of humic substances in the water column, as represented by a measurement of water colour. The standards are expressed as the boundary between each status class, and this value represents the nitrogen concentration required to support biological status in each class. Thus the terms “standard” and “boundary value” are used interchangeably, e.g. the High/Good boundary value represents the nitrogen concentration that must be achieved for the water body to be in High Status.

The nitrogen standards for lakes were derived in accordance with the technical guidance published by the EU WFD Common Implementation Strategy (WFD CIS 2019). The technical details of the standard derivation are available in the UKTAG consultation document and annex on proposed biological and environment standards for river basin planning (UKTAG 2019).

Lake nitrogen standards are based on total nitrogen (TN) data, determined using a digestion step on a whole (unfiltered) water sample. Samples for analysis of total nitrogen should be collected from a location representative of the water body being assessed. Samples should ideally be taken at evenly spaced intervals e.g. monthly, over the course of a year or years. For the purposes of WFD classification a time period of 3 years is normally used.

The standards are applicable to freshwater and brackish lakes in the UK.

3. Data and information requirements

To determine the appropriate lake type it is necessary to have information on lake mean depth (in metres) and colour (measured as Hazen or Platinum units) for the lake in question.

Lake mean depth, measured in metres. Where there is no bathymetry data and the mean depth is not known accurately, a modelled mean depth may be used, for example derived from a topographic model or from a known maximum depth.
Colour is used as a proxy for the humic character of the lake, and is measured by colorimetry as Hazen (or Platinum-Cobalt) units. This may be expressed as mg/L Pt.

Table 1: Lake type parameters for determination of the appropriate nitrogen standard

Lake type	**Colour (mg/L, Platinum units)**	**Mean depth (metres)**
Clear, very shallow	<30	<3
Clear, shallow	<30	3 – 15
Clear, deep	<30	>15
Humic, very shallow	≥30	<3
Humic, shallow	≥30	3-15
Humic, deep	≥30	>15

4. Assessment of lake total nitrogen status

Nitrogen status is assessed by comparing the arithmetic mean value from measured nitrogen data with the derived standards (Table 2).

Confidence of classification for supporting elements such as nitrogen should be reported, and is calculated using standard procedures for water quality assessments. A spreadsheet calculator is provided on the UKTAG website.

Table 2: Type-specific class boundaries for total nitrogen (mg/L)

Lake type	**Class boundary value (mg/l Total Nitrogen)**			
	High	Good	Moderate	Poor
Clear, very shallow	0.66	1.07	2.13	4.27
Clear, shallow	0.48	0.77	1.54	3.08
Clear, deep	0.46	0.74	1.47	2.94
Humic, very shallow	0.91	1.46	2.93	5.85
Humic, shallow	0.81	1.30	2.60	5.20
Humic, deep	0.72	1.16	2.32	4.65

4.0 References

UKTAG (2019) Proposed biological and environmental standards for river basin planning. Consultation document UKTAG 2019 Consultation Document

UKTAG (2019) Proposed biological and environmental standards for river basin planning. Annexes UKAG 2019 Consultation Annexes

WFD CIS (2019) Best practice for establishing nutrient concentrations to support good ecological status. Nutrients - Best practice